

STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY
SCIENTIFIC CRIME DETECTION LABORATORY

BREATH ALCOHOL TESTING PROGRAM MANUAL



Orin Dym – Forensic Laboratory Manager

Nita Bolz – Scientific Director – Statewide Forensic Alcohol Program

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BREATH ALCOHOL PROGRAM CONTACT INFORMATION

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INTRODUCTION

This manual is intended for use as a training guide for Alaska breath test operators of the approved evidential breath test instrument. It is not a comprehensive procedure manual for impaired driving and DUI processing. Officers should use this to supplement their agencies' policies and procedures. If there are additional questions officers should contact the breath alcohol section at the Alaska Scientific Crime Detection Laboratory (crime lab).

The breath test program is part of the crime lab. The section includes the scientific director of the breath and blood alcohol testing program and the forensic scientists and technicians. The duties of the breath test program include: breath test instrument certification, calibration and maintenance; administration of records; training and court testimony. One responsibility of the breath alcohol section is to train the breath test supervisors. This is accomplished by providing certification and recertification courses at the crime lab. In turn the breath test supervisors are responsible for training the breath test operators in their area.

The following information is taken from the Alaska Criminal and Traffic Law Manual:

13 AAC 63.050. Breath test operator certification

(a) To be certified as an operator of a breath test instrument, an applicant must successfully complete a course of instruction approved by the scientific director. The course must include at least eight hours of instruction in the theory of alcohol physiology, toxicology, pharmacology, instrument maintenance, practical operation, and administrative procedures. The applicant must also obtain a score of 75 percent or higher on a written examination, approved by the scientific director, covering the content of the course.

(b) The scientific director will, in his or her discretion, issue an operator certificate and operator identification number to an applicant upon receipt of written notice from a supervisor that the applicant has successfully completed a course of training and examination that meets the requirements of this section. An operator certificate expires three years after the date issued.

13 AAC 63.060. Breath test operator recertification

(a) To renew a breath test operator's certification, a breath test operator must, during the period of the operator's current certification,

(1) complete a refresher course approved by the scientific director that includes at least four hours of instruction and training; and

(2) obtain a score of 75 percent or higher on a written examination, approved by the scientific director, covering the content of the refresher course.

(b) The breath test supervisor shall submit a written notice to the scientific director that an operator seeking to renew a breath test operator's certificate has complied with the

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requirements of (a) of this section. Upon receipt of the notice, the scientific director shall renew the breath test operator certificate and operator identification number.

(c) A breath test operator certificate that has been renewed under this section expires three years after the date issued.

13 AAC 63.070. Breath test supervisor certification and duties

(a) To be certified as a breath test supervisor, an applicant must

(1) complete a 40-hour supervisor training course approved by the scientific director; the course must include instruction in the theory of alcohol physiology, pharmacology, toxicology, instrument function, instrument maintenance, practical operation, administrative procedures, legal considerations, and other pertinent subjects as required by the scientific director;

(2) possess a valid instructor's certificate issued by the Alaska Police Standards Council under 13 AAC 87.040; and

(3) obtain a score of 75 percent or higher on a written examination, approved by the scientific director, covering the content of the training course.

(b) The scientific director shall issue a breath test supervisor certificate and an identification number to an applicant if the applicant has met the requirements of (a) of this section. A breath test supervisor certificate expires at 11:59 p.m. on December 31 of the third year after the year issued.

(c) In addition to performing all the duties of an operator, a breath test supervisor may train breath test operators and perform routine maintenance on a breath test instrument. A supervisor certificate is also an operator's certificate.

(d) A breath test supervisor shall inform the scientific director of the location of breath test instruments and the status of breath test operators under the breath test supervisor's supervision.

13 AAC 63.080. Breath test supervisor recertification

(a) To renew a breath test supervisor's certification, a supervisor must, during the period of the supervisor's current certification,

(1) complete a refresher course approved by the scientific director that includes at least 15 hours of instruction and training; and

(2) obtain a score of 75 percent or higher on a written examination, approved by the scientific director, covering the content of the refresher course.

(b) If the breath test supervisor has met the requirements of (a) of this section, that supervisor may request in writing a renewed certificate from the scientific director. Upon receipt of the request, the scientific director shall renew the certificate.

(c) A breath test supervisor certificate that is renewed under this section expires at 11:59 p.m. on December 31 of the third year after the year issued.

BREATH TEST INSTRUMENT ASSIGNMENT TO AGENCIES

Evidential breath test instruments are the property of the State of Alaska. Exceptions exist where agencies have purchased instruments independently. The state-owned instruments

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are entrusted to the responsible care and use by the assigned agency. Breath test supervisors are responsible for the day-to-day operation and upkeep of these instruments and are accountable for problems arising from neglect and/or misuse of the instruments.

Evidential breath instruments are placed at law enforcement and other locations by the scientific director. The crime lab will supply and maintain breath test instruments at the designated location. The crime lab reserves the right to remove an instrument from a location under the following circumstances:

- Substantiated abuse or neglect in maintenance and operation of the instrument
- Lack of communication with the crime lab
- Lack of a breath test supervisor at the breath test instrument location
- The instrument is not used or needed
- At the discretion of the scientific director

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ETHANOL**ETHANOL BEVERAGE AND CHEMICAL PROPERTIES**

The chemical formula for ethanol (ethyl alcohol) is $\text{CH}_3\text{CH}_2\text{OH}$. Ethanol is a simple molecule containing carbon, hydrogen and oxygen atoms.

Ethanol in its purest state:

- is a colorless liquid.
- is infinitely soluble in water.
- is a volatile substance.
- is slightly less dense than water.

Alcohol can be produced naturally through the process of fermentation or synthetically through chemical means.

Beer usually contains approximately 4% to 6% ethanol by volume. Wine usually contains approximately 8% and 12% ethanol by volume. Beer and wine are produced by allowing yeast to act on a mixture of grains and water (beer) or fruit and water (wine). Distilled spirits usually contain approximately 40% to 50% ethanol by volume and are produced by concentrating ethanol generated from the products of fermentation.

In the United States the ethanol concentration of distilled beverages is shown by the proof system. The proof of an alcoholic beverage is equal to twice the ethanol concentration. For example: 100-proof whiskey contains 50% ethanol by volume. Pure ethanol would be 200 proof because it is 100% ethanol.

A “standard drink” is defined as:

- ½ oz pure ethanol.
- 1 12 oz American beer.
- 1 to 1½ oz of 80 to 100 proof distilled spirits.
- 4 to 6 oz of table wine.

ETHANOL ABSORPTION

Ethanol can enter the human body in several different manners: ingestion, injection, inhalation, and skin absorption. Ingestion is the most common method for ethanol to enter the body. Ethanol is absorbed into the blood stream by contact with and diffusion through mucous membranes. The mouth, throat, and the entire gastrointestinal tract are all common sites of alcohol absorption.

Once the alcoholic beverage enters the oral cavity absorption begins immediately. The amount of ethanol absorbed in the mouth is generally insignificant due to the short amount of time that the alcohol is held in the mouth. Absorption continues as the beverage passes into the stomach. When the alcoholic beverage reaches the stomach

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approximately 10-20% of the ethanol is absorbed through the stomach lining directly into the blood stream. The pyloric sphincter will allow the stomach contents to pass into the small intestine where approximately 80 % of the alcohol is absorbed into the blood stream. The small intestine is the site of the most rapid absorption of ethanol due to its large membrane surface area and rich blood supply.

The rate of gastric emptying is the most important factor regulating the rate of absorption of ethanol. The amount of food in the stomach is the primary factor in determining gastric emptying; however, there are many other factors that can play a minor role. In general the majority of absorption has occurred within the first sixty minutes post consumption (Garriott, 2003).

ETHANOL DISTRIBUTION

Once the ethanol has been absorbed into the blood from the digestive system it is transported throughout the body. Because ethanol is physically inseparable from water it travels throughout the body to all of the tissues containing water. The final concentration of ethanol in the various tissues depends on the tissue water content.

Body water content varies according to sex. Since the concentration of alcohol is directly proportional to the body water content the concentration varies according to lean body weight. Women have a proportionally larger amount of adipose (fat) tissue than men and therefore have less water content. The tissue water content can also vary from one individual to another. An obese person has less water per pound of body weight than an emaciated person because adipose tissue has very low water content. Based on these factors women and individuals with a higher proportion of adipose tissue will have a higher blood ethanol level than men and individuals with lean body mass after consuming the same amount of ethanol.

ETHANOL ELIMINATION

Ethanol is removed or eliminated from the body via metabolism, excretion and evaporation. Metabolic processes account for the elimination of most of the ethanol consumed. As the ethanol is transported through the body with the blood it passes repeatedly through the liver. During each pass through the liver some of the ethanol is metabolized by the enzyme alcohol dehydrogenase (ADH).

The rate at which ethanol is metabolized is relatively constant for a particular individual at a particular time but varies somewhat from one person to another. Reported rates for ethanol metabolism usually range from 0.010 g/210L to 0.025 g/210L per hour. The average elimination rate is generally accepted as 0.017 g/210L per hour. Higher rates of metabolism have been reported and are usually associated with chronic consumption of large quantities of ethanol (Garriott, 2003).

Ethanol can also be eliminated from the body through other methods such as excretion in the urine, evaporation through perspiration and exhalation of ethanol through the breath.

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Some of the ingested ethanol is eliminated from the body through gas exchange in the lungs. The exchange of ethanol from the blood to the breath occurs in the alveoli and bronchi of the lungs. The alveoli are minute tissue sacs in the lungs that are richly supplied with blood from the capillaries. By diffusion, some of the alcohol in the blood can evaporate into the breath. This exchange of alcohol from the blood to the breath can be described by Henry's Law.

Henry's Law states that at a given temperature the concentration of a volatile substance in the air above a liquid is proportional to the total concentration of the volatile substance in the liquid.

As the ethanol molecules move from the alveoli through the lungs into the mouth cavity the concentration of the ethanol decreases. This decrease is due to dilution with fresh air. Therefore deep lung or alveolar air ethanol concentration provides the closest correlation to the blood alcohol concentration.

EFFECTS OF ETHANOL IMPAIRMENT

Ethanol acts as a central nervous system depressant. Central nervous system depressants slow nerve signal transmissions resulting in the reduction of normal physical and mental faculties. In relation to driving-related impairment ethanol's primary effects are on judgment, reaction time and coordination.

An example of a judgment driving-related impairment would be speeding up to proceed through a yellow light when normally you would slow down or stop. An example of reaction time driving-related impairment would be an increase in the amount of time a driver requires to slow when another car unexpectedly crosses their path. Coordination includes the ability to perform divided attention tasks. Driving requires the individual to perform multiple duties simultaneously such as pressing the gas pedal, maintaining lane position, signaling lane changes and maintaining a safe distance from other vehicles.

IMPAIRMENT BY SUBSTANCES OTHER THAN ETHANOL

The breath test operator should be aware that symptoms similar to alcohol intoxication can be produced by a combination of ethanol and drugs, drugs alone, or certain diseases or illness.

When ethanol is consumed in combination with other drugs the symptoms of ethanol intoxication may be altered. This may explain a situation where an individual appears very intoxicated but the breath alcohol test results demonstrate a low level of ethanol. If a breath test operator observes this situation the best course of action would be to contact a Drug Recognition Expert (DRE) if available and/or obtain a legal blood sample.

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CHEMICAL TESTING FOR ETHANOL

Chemical tests for ethanol can be performed on most specimens of body fluids. Whole blood (blood containing all of its components) and serum/plasma (blood centrifuged to remove red blood cells) are examples of blood that can be used for ethanol analysis. Serum/plasma contain a higher percentage of body water than whole blood and consequently are more concentrated (~15%) with ethanol.

The units for blood or other bodily fluid testing are usually reported in grams (g) or milligrams (mg) per unit volume, measured in deciliters (dL) or the equivalent volume 100 milliliters (mL).

Example: 0.080 g/100 mL is the equivalent to 80 mg/100 mL or 80 mg/dL

Whole blood collected in a gray top vacutainer blood collection tube is the preferred specimen for analysis at the crime lab. Gray top tubes contain a preservative and anticoagulant to preserve forensic blood ethanol samples. Blood collection kits containing these tubes are available to officers through Department of Public Safety (DPS) supply. Blood samples submitted to the crime lab are analyzed by headspace gas chromatography and are reported in units of g/100 mL.

Blood samples analyzed in the hospital setting are typically analyzed using serum and therefore will have a higher concentration of ethanol than whole blood samples. Hospital blood samples are often reported in units of mg/dL or mg/100 mL.

Breath samples can also be analyzed for ethanol content because of the relationship between the ethanol concentration in blood and breath. This relationship is called the partition coefficient or the blood: breath ratio. On average, at a temperature of 34°C (approximate exhaled breath temperature), ethanol will move from the blood to the breath at a ratio of 2280: 1. This means that for every 2280 molecules of ethanol in the blood one will escape into the breath. Current evidential breath testing instruments use a ratio of 2100: 1 when calculating the breath result. Therefore if blood and breath tests are taken simultaneously the breath result will be an underestimate of the individual's alcohol level for the majority of the population (Garriott, 2003).

EVIDENTIAL BREATH TEST INSTRUMENT

Currently the only approved evidential breath test instrument in the State of Alaska is the DataMaster cdm. The DataMaster is manufactured by National Patent Analytical Systems in Mansfield, Ohio.

NPAS, Inc
PO Box 1435
Mansfield, OH 44901
1-800-800-8143
www.npas.com

**GENERAL FEATURES**

The main features of the DataMaster cdm include a thermo-electrically cooled infrared detector to increase stability, a folded optical path length, a 37 mL sample cell volume, narrow bandwidth with optical filters, a gray body infrared source and thermistor flow detection. Other additional features include: a dedicated internal quartz standard of known and constant absorption allowing for repeated verification of calibration, a single point calibration, a sealed detection system, a three filter system that eliminates potentially interfering compounds, electronic options with password security and a radio frequency interference (RFI) detection system. (Fusco, Radomski, 2003)

EXTERNAL FEATURES

External features of the DataMaster cdm include: heated breath hose, simulator ports, gas valve, RFI antenna, modem receptacle and calibration port. The cover of the DataMaster cdm is made of 18-gauge steel. The steel cover protects the electronic components and the microprocessor from RFI. The LCD display panel provides instructions and messages for operation of the DataMaster cdm.



Rear Panel of DataMaster cdm

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SPECIAL OPERATIONS KEYS

The special operations keys are the top row of keys on the DataMaster cdm keyboard. They are directed by the software program in the microprocessor and their functions are specific to Alaska software. The keys are password protected.

- Run – This key will initiate a test sequence.
- Clock – This key is inactive.
- P1 – This key is inactive.
- P2 – This key is inactive.
- SET – The SET key works in tandem with the ADV key. They are used by breath test operators and breath test supervisors to set the date and time. The breath test supervisor is able to choose if the ethanol level is displayed, refusal query, the number of test strip copies, number of supervisor tests and internal/external printer options. The SET key is pressed repeatedly to scroll through the various menu options.
- ADV – The ADV key activates the menu option displayed after pressing the SET key.
- F1 – The F1 key works in tandem with the F2 key. They are used by breath test operators and breath test supervisors to reset options, print options, log off and purge the sample chamber. The breath test supervisor is also able to remove and return the instrument from service, purge the gas line and change the programmed external standard target value. The F1 key is pressed repeatedly to scroll through the various menu options.
- F2 – The F2 key activates the menu option displayed after pressing the F1 key.
- SUP – This key initiates sequential external standard tests.
- TST – This key initiates an automatic instrument self-test of all the settings and circuits essential to the integrity of the breath test. If any setting or circuit is outside allowable range it will be marked by 'ERROR'.
- MTR – This key initiates a display of the detector voltage and barometric pressure.
- NV – This key is used during calibration and is not accessible to the breath test operator or breath test supervisor.
- CLR – This key clears the display.
- ABT – This key aborts or ends a subject test, supervisor test or diagnostic test. This key is not accessible to the breath test operator.
- CPY – This key prints an additional copy of the last test in memory.



Keyboard of Datamaster cdm

PRINTERS

The DataMaster cdm comes standard with an internal printer. A responsibility of the breath test operator and breath test supervisor includes replacing paper rolls and printer ribbons. Change a roll of paper by unlocking the printer well, placing a new roll of paper into the cavity of the printer well, feed the free end of the paper behind the printer head and over the metal strip, press the USER 1 key to advance the paper, thread the paper roll through the slot in the cover of the printer well and replace the cover. To replace the printer ribbon, remove the printer door and press the eject button. Replace with a new printer ribbon.

The DataMaster cdm has the option of being used with an external laser jet printer. For more information on using an external printer please contact the breath alcohol section.

ANALYTICAL PRINCIPLES

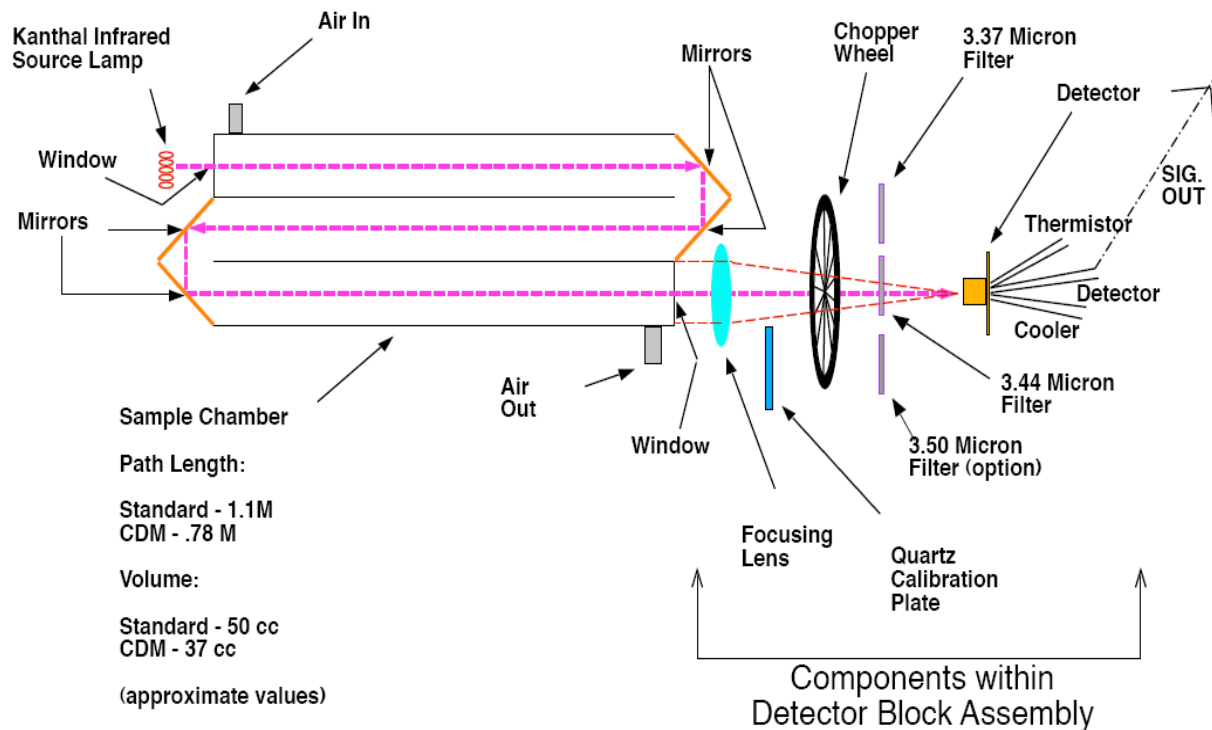
The DataMaster cdm employs the principles of infrared spectroscopy for the purpose of measuring the level of ethanol in breath samples for forensic purposes. Infrared (IR) energy is part of the electromagnetic spectrum. It is measured in frequencies expressed as micrometers (μm). When a molecule is exposed to IR energy the bonds of the molecule will absorb the energy. Different types of molecular bonds will absorb different frequencies of IR energy. IR energy is used by the DataMaster to detect and measure the amount of ethanol present in a breath sample. The frequencies used are 3.37 μm , 3.44 μm and 3.50 μm .

DATAMASTER cdm SYSTEMS

The DataMaster cdm is comprised of three basic systems: the optical system, the breath/airflow system and the electronic and microprocessor system.

The optical system describes the mechanisms of the DataMaster cdm directly involved in the analysis of vapor samples for the identification and quantification of ethanol. The optical system consists of the following components:

DataMaster cdm Optical Bench



- IR Source – emits IR energy when current passes through it
- Sample Chamber – holds approximately 37 mL of vapor, heated to 50°C +/- 5°C, and is folded to a total length of 0.78 m
- Mirrors – located at both folds of the sample chamber for the purpose of reflecting IR energy
- Focusing Lens – the IR energy is focused onto the surface of the detector by a lens located in the detector block
- Chopper Wheel – interrupts the light energy as it is being focused on the detector allowing for separation and amplification of the IR energy.
- Filters – The IR energy exiting the sample chamber is filtered through three filters (3.44, 3.37, and 3.50 μ m)
- Calibration Plate (Internal Standard) – 1 mm thick piece of quartz that is moved into the optical path when the internal standard check is performed
- Detector – made of lead selenide (PbSe) and is typical for applications in the 2 - 5 μ m range

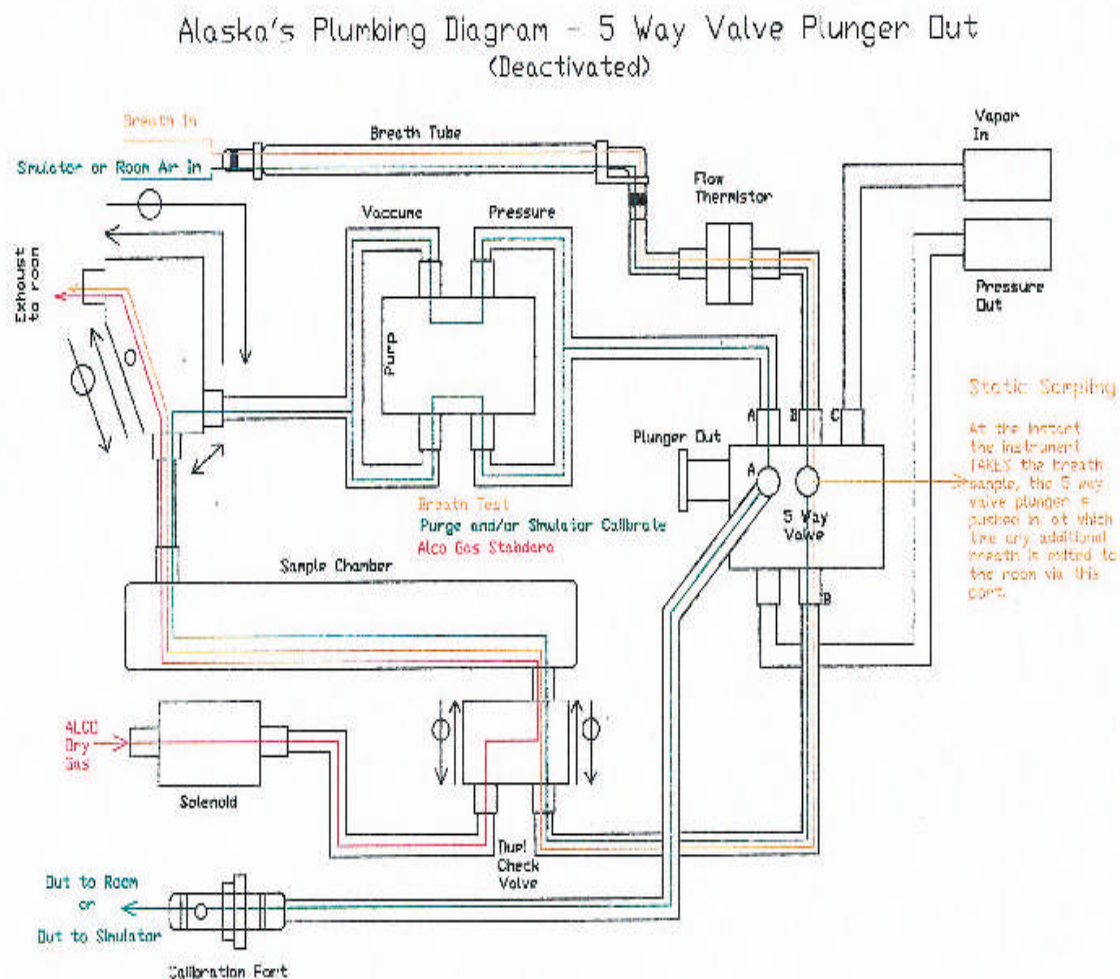
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The breath/airflow system describes the mechanism of the DataMaster cdm that moves vapor samples in and out of the sample chamber and also purges the sample chamber with fresh air. It is comprised of the following components:

- Heated External Breath Hose
- Internal Breath Tubing – provides a pathway for vapor samples and room air to circulate between the breath hose, the intake of the control sample ports, the sample chamber and outlet ports
- 5-Way Valve – an internal valve that controls the airflow path through a series of signals sent from the microprocessor
- Sample Chamber
- Pump – a single, dual-diaphragm pump that creates a vacuum/pressure that will draw or push air through the system

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- Snubber – a pneumatic capacitor that levels out airflow produced by the pump, reduces air fluctuations and helps the check valve remain closed
- Check Valve – a white fitting located within the airflow pathway that only allows air into the instrument
- Calibration Port
- Simulator Inlet and Outlet Ports

The electronic and microprocessor system includes the power supply and connections as well as the software that controls all operations of the instrument. The electronic and microprocessor system is comprised of the following components:

- Microprocessor – executes the software instruction contained in EPROM governing all operational aspects of the DataMaster cdm including the reporting of the breath test results based on the response of the IR detector. The microprocessor is a central processing unit (CPU).
- Electronic- includes the power supply, clock and memory
- EPROM – erasable programmable read only memory
- RAM – random access memory

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SUBJECT TESTS

It is essential that breath test operators and breath test supervisors follow the proper procedures when administering a breath test. The subject should be carefully observed during the breath test so his/her actions, demeanor, and behavior can be documented.

PRE-TEST PROCEDURES

Radios should be turned off within 30 feet of the testing area. The testing area should be free from organic solvents and fumes, including exhaust fumes. When feasible subjects should be kept away from the breath test instrument except when they are providing a breath sample.

13 AAC 63.040. Procedure for breath test analysis

(a) The following procedure must be used to obtain and analyze a breath sample on a breath test instrument:

- (1) observe the person to be tested for at least 15 minutes immediately before testing, to ensure that the person does not regurgitate or place anything in his or her mouth during that period;*
- (2) respond to the visual display on the instrument by entering the data requested;*
- (3) when the visual display indicates that the instrument is ready to accept the person's breath sample, instruct the person to blow into the mouthpiece until the visual display indicates that a satisfactory sample has been obtained.*

(b) Only a person certified as an operator under 13 AAC 63.050 may operate a breath test instrument, except that a supervisor may supervise the use of an instrument by a non-certified person for training or demonstration purposes.

INSTRUMENT PREPARATION

The DataMaster should display READY-PUSH RUN. The operator should verify that the time and date display is accurate on the DataMaster and correct if necessary using the SET/ADV keys. Turn on the external standard using the appropriate valve for the style of regulator in use. The breath test operator should supply a new mouthpiece for each breath testing sequence.

SUBJECT TEST SEQUENCE

The breath tests operator presses the RUN key to initiate a subject test. The following prompts will appear for the breath test operator to enter the required information:

OPERATOR'S NAME (L/F/M):

The breath test operator types in his/her name.

OPERATOR'S NUMBER:

The breath test operator enters the number assigned to him/her.

SUBJECT'S LAST NAME:

The breath test operator enters the last name of the subject being tested.

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SUBJECT'S FIRST NAME/MI:

The breath test operator enters the first name and middle initial of the subject being tested.

O.L.#

The breath test operator enters the driver's license number of the subject.

DEPT/AGENCY:

The breath test operator enters the 4-character code indicating the agency he/she works for.

CASE/REPORT:

The breath test operator enters the agency case number.

TEST TYPE:

The breath test operator enters the designated code for the reason the subject test is being performed. The selections are:

D = DUI

M = Minor consuming alcohol

C = Court ordered

O = Other

T = Testing

V = Verification of Calibration

ALCO TARGET VALUE:

The breath test operator enters the target value assigned to the external standard.

ALCO S/N:

The breath test operator enters the serial number assigned to the external standard

REVIEW DATA? <Y/N>

The breath analysis portion of the test is automatic. Once in progress the breath test operator cannot alter the operation of the instrument. The breath test operator's duties from this point until the end of the test are to make sure the external standard is attached to the instrument and the gas is flowing. The breath test operator is responsible for instructing the subject how and when to provide a breath sample. The breath test operator should provide a new mouthpiece for each subject test sequence. The following are descriptions of each portion of the subject test:

PURGING AND AMBIENT TESTING

All chambers and internal plumbing are cleansed of any residual volatile substances by room air. Room air is pulled through the breath tube and pumped throughout the instrument by an internal pump. During the purging process the instrument takes two measurements of the detector voltage that must agree within prescribed tolerance. If the measurements don't agree the test aborts with an AMBIENT FAIL status message.

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AMBIENT ZEROING

The DataMaster determines zero references based on ambient air in the sample chamber. Each of the three filters is inserted into the IR path to establish a zero reference at each wavelength.

BLANK TEST

A measurement is taken after the AMBIENT ZEROING phase of the operation. This ensures the sample chamber is clear before the subject sample.

INTERNAL STANDARD CHECK

A quartz plate is inserted into the IR path to assure that the accuracy of the DataMaster has not changed since the last calibration.

EXTERNAL STANDARD

A sample of an ethanol dry gas standard is pulled through the gas line into the sample chamber, the sample is analyzed and the results are displayed.

BLANK TEST

A measurement is taken after the AMBIENT ZEROING phase of the operation. This ensures the sample chamber is clear before the subject sample.

PLEASE BLOW

The subject provides a sample of their breath. An intermittent beeping sound will be heard until a breath sample is provided with a sufficient flow rate to satisfy the requirements of the sampling system. The subject has two minutes to provide an adequate sample. As they blow through the instrument a measurement is taken four times per second. Once the subject sample requirements have been met the final portion of the breath is captured and analyzed.

TEST RESULTS

The measured ethanol result is calculated.

PURGING

AMBIENT ZEROING

BLANK TEST

EXTERNAL STANDARD

PURGING

AMBIENT ZEROING

BLANK TEST

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The subject test results print automatically after the end of the test. Test results are stored into memory. The crime lab uploads data files periodically and test results may be obtained from the uploaded data files. If the test strip fails to print or an error occurs during printing the breath test operator should hit the CPY special operation key which will print the last test in the memory. Following the printing of the test strip the breath test operator should verify that the test completed.

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ALASKA DEPARTMENT OF PUBLIC SAFETY
DATAMASTER cdm 138294

FEBRUARY 04, 2010

OPERATOR'S NAME:
  OBRYAN/COLLEEN/S
OPERATOR'S NUMBER: 6237
SUBJECT'S LAST NAME:
  UOC
SUBJECT'S FIRST NAME/MI :
  UOC
O.L. #: 0123456
DEPT/AGENCY: AAA1
CASE/REPORT: 10-1234
TEST TYPE: U
ALCO TARGET VALUE: 0.000
ALCO S/N: SCOTT08

  --- BREATH ANALYSIS ---

.000 ADJUSTED FOR 29.64 in
ALCO TARGET          .079      07:04
BLANK TEST           .000      07:05
INTERNAL STANDARD    VERIFIED  07:05
ALCO TV 29.64 in    .078      07:06
BLANK TEST           .000      07:06
SUBJECT SAMPLE       .000      07:07
BLANK TEST           .000      07:08
ALCO TV 29.64 in    .077      07:08
BLANK TEST           .000      07:09

```

Example of a complete subject test strip

SAMPLE ACCEPTANCE PARAMETERS

The DataMaster accepts a breath sample after the subject has provided a sample into the breath hose and the sample provided has met the necessary criteria for analysis.

A breath sample is accepted when it meets the following criteria:

- A minimum flow rate is required. For the duration of the blow the flow rate must not drop below the minimum requirements. The minimum flow rate is approximately 3.8 L/min.
- A minimum volume of breath is required. The minimum volume is approximately 1500 mL.
- The breath alcohol profile must have reached a plateau.
- The breath alcohol profile must never have a negative slope.

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QUALITY ASSURANCE

INTRODUCTION

There are numerous measures that are taken to ensure the quality of each breath sample. External standards, internal standards and blank tests are performed with each breath sample. A verification of calibration is performed by a breath test supervisor every 60 days or when the external standard is changed.

QUALITY ASSURANCE MEASURES

A blank test follows each purging cycle to verify the sample chamber is clear prior to taking a measurement.

The internal standard is a quartz plate that is inserted into the IR path to ensure the accuracy of the instrument has not changed since the last calibration. Each instrument stores in memory the IR absorption value of this quartz standard at the time of calibration. The measurement of the quartz plate at the time of the test is compared to the stored value and must agree within prescribed limits or the test will be aborted.

The external standard is a metal cylinder containing a mixture of ethanol and an inert gas under pressure. It is also referred to as an Alco. The external standard tank is connected to the instrument through a regulator and tubing.

External standards deliver a known quantity of ethanol to the instrument at specific times in the breath test procedure. This is done to test the ability of the instrument to accurately recognize and quantitate ethanol. The allowable range for the external standard is +/- 0.010 from the target value adjusted for barometric pressure.

A verification of calibration report is performed to verify the instrument's calibration is valid and the instrument is functioning properly. It consists of a diagnostic test, which is a self check of the instrument, and a non-drinking subject test. These reports are prepared by breath test supervisors and approved by the scientific director. Records of these documents are kept in the normal course of business at the crime lab.

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BREATH TEST SUPERVISOR DUTIES

DUTIES AND RESPONSIBILITIES OF BREATH TEST SUPERVISORS

Breath test supervisors are responsible for performing the following duties at their agencies:

- Instructing fellow officers how to operate the evidential breath testing instrument and how to properly administer a breath test.
- Perform verification of calibration reports and submit them to the crime lab in a timely manner.
- Perform routine maintenance and troubleshooting on his/her instrument.
- Order and replace external standards.
- Maintaining the paperwork associated with breath test operators he/she has instructed. This includes informing the crime lab when breath test operators relocate or change names.
- Communicate with the crime lab about instrument issues, operator status or questions about paperwork.
- Maintain and submit to the crime lab paperwork associated with the instrument.
- Timely response to all communications from the breath test section.
- Breath test supervisors may be asked to perform other duties or take on additional responsibilities depending on individual circumstances.

BREATH TEST INSTRUMENT TRANSPORT TO AND FROM AGENCIES

Breath testing equipment is shipped to agencies from the crime lab. The crime lab pays for the outgoing shipping on instruments, supplies and external standards. When instruments are to be shipped commercially they will be wrapped in a protective plastic covering and placed in an approved shipping case. A list of instructions to the breath test supervisor regarding instrument care will be included inside the shipping container. If the instrument received was intended to replace an existing instrument package the previous instrument in a similar manner and return to the crime lab. External standards should be shipped in a cardboard carton.

Individual agencies are responsible for return shipment of instruments, supplies, external standards and shipping containers to the crime lab. Agencies may use the most cost effective means to ship the equipment. When external standards are shipped to the crime lab via mail or other commercial transport they must be emptied of all remaining gas. Please note that when cylinders are empty they are not considered hazardous material and do not need to be shipped as such. It is recommended that the supervisor notify the crime lab regarding any shipping information (carrier, waybill information, date shipped) when equipment is returned.

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BREATH TEST INSTRUMENT SET-UP

The following instructions are general guidelines for receiving and setting up an evidential breath testing instrument for operation.

1. Let the instrument sit for several hours or overnight so it can warm to room temperature.
2. Make sure that an APC line voltage regulator unit is present and set up according to the instructions with the unit. (APCs are supplied by the crime lab.)
3. Check the paper supply to ensure that printer cartridge is not loose and the paper is properly seated.
4. Attach the breath hose, RFI antenna and modem line.
5. Plug the instrument into the prepared APC unit and turn it on.
6. Attach the external standard and program the target value using the F1 and F2 keys.
7. Perform a verification of calibration and fill out a change in instrument status form to put the instrument in service.

The breath test supervisor can change various settings on the DataMaster according to the individual agency's preference. Examples of settings that can be changed include: the number of copies of the test strip printed, whether the alcohol value is displayed during the subject blow, the use of the refusal query and internal/external printer options.

INSTRUMENT LOCATION

It is important that the evidential breath test instrument location is secure. The power source should be of good quality and the instrument plugged into an APC supplied by the crime lab. Contact the crime lab for replacement APC units or replacement batteries.

In order to purge the sample chamber between tests the DataMaster requires that clean air is flushed through the sample chamber. A symptom of a poorly ventilated testing area is the occurrence of multiple AMBIENT FAIL status codes.

High room temperatures can cause operational problems for the instruments. A symptom of an overheated room is multiple SYSTEM WONT ZERO or AMBIENT FAIL status messages. It is essential that the underside of the instrument is not blocked.

The RFI antenna located on the rear panel of the instrument will cause a test to abort if radio frequency is detected within the immediate area. All radios in the vicinity of the instrument need to be turned off when a DataMaster test is in progress.

Agencies are requested to provide a dedicated telephone line for use with the DataMaster. Subject test data is uploaded to a host computer located in the crime lab. The uploading process is initiated manually by the crime lab.

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EXTERNAL STANDARDS

Alco is an alternative term given to the compressed gas cylinders used as an external standard with the DataMaster. The external standard delivers a known quantity of ethanol to the DataMaster both before and after the subject sample. The purpose is to ensure the DataMaster is accurately recognizing and quantitating ethanol concentrations.

There are two types of external standards currently in use by the breath test program, cylinders prepared in-house and commercially prepared cylinders. Each cylinder will have a label affixed which contains information on the serial number, instrument number, target value and shipping instructions.

Regulators are used with the external standard for the purpose of delivering gas to the DataMaster. There are several types of regulators in use: an older, brass model manufactured by Harris Calorific, a newer, stainless steel model manufactured by Air Liquide and a small model that is used with the commercially purchased external standard.

Both models of regulators used with the crime lab cylinders have two gauges. The gauge on the right side of the regulator shows the overall pressure in the cylinder. Pressure units are in psi. A full or new external standard usually contains between 1000 and 1400 psi. Replacement cylinders should be requested when the pressure is <250 psi. The gauge on the left indicates the pressure of the gas flowing to the instrument; however, this can only be read when the gas is flowing. The pressure on the left gauge is set at 5 psi by the crime lab and may be adjusted by the breath test supervisor at the agency.

The regulators for use with the commercial cylinders consist of only one gauge. This gauge measures the overall pressure of the external standard cylinder. The flow rate of these regulators is not adjustable. To turn the gas on push and turn the small dial on the side of the regulator.



Air Liquide



Commercially prepared



Harris Calorific

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Replacement cylinders can be ordered by e-mail or phone.

E-mail requests should be sent to dps.scdl.toxicology@alaska.gov.
Phone requests (907) 269-5740

Allow 2-4 days for the cylinder to arrive. When the new cylinder arrives, check the label for accuracy, attach the regulator, program the target value using the F1/F2 keys and perform a verification of calibration.

For cylinders prepared at the crime lab drain any remaining gas from the old cylinder if it will be mailed or shipped by a commercial shipper. Replace the plug into the valve opening of the old tank and package it in the same box that held the new cylinder. Return the empty cylinder (these are not hazardous materials if they are empty).

OPERATOR TRAINING

Alaska Administrative Code requires that all breath test operators complete an eight hour course of instruction approved by the scientific director. Breath test supervisors provide this instruction at their agency. The curriculum of the course should include eight hours of instruction in the theory of alcohol physiology, toxicology, pharmacology, instrument maintenance, practical operation and administrative procedures. Breath test supervisor's training includes instruction on how to teach the breath test operator courses and an approved presentation is available. At the completion of the course the operator must take and pass, with a 75 percent or greater, the approved written examination. The approved breath test operator exam and key is available through the breath section of the crime lab. Upon successful completion of the course, the breath test supervisor will complete the Request for Change in Operator Certification/Recertification form and submit it to the crime lab. The breath test operator will be issued a certificate and operator number from the scientific director which expires three years from the date of issue.

Breath test supervisors are also responsible for teaching recertification courses to breath test operators. Per Alaska Administrative Code the recertification must be completed during the period of the breath test operator's certification. It must contain at least four hours of instruction and training and they must pass the written examination with a 75 percent or greater. After completion of the course the breath test supervisor must complete the Request for Change in Operator Certification/Recertification form and submit it to the crime lab. The breath test operator will be issued a new operator card by the scientific director which will expire three years after the date of issue.

If any breath test operators are expired at the time of the course they must take the full eight hour certification course and not the recertification course. If the breath test supervisors have any questions about breath test operator instruction they should contact the crime lab for assistance.

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SUPERVISOR PAPERWORK

Verification of Calibration Reports

A Verification of Calibration report is a document that establishes that a particular instrument is working properly and is accurately calibrated at the time of the report and also for a period of time prior to and after the date of the report.

Verification of Calibration reports should be performed every 60 days as long as the instrument is in service, when the external standard is replaced or when any functional maintenance is performed on the instrument.

The procedure for preparing a Verification of Calibration report is as follows.

1. If the external standard has been changed the target value must be reprogrammed using the F1/F2 special operation keys. If the external standard was not changed the supervisor should verify the target value is programmed correctly.
2. Perform a diagnostic test using the TST special operations key and verify that all circuits read OKAY (see below).
3. Perform a non-drinking subject test and verify that external standards read within +/- 0.010 of the target value adjusted for barometric pressure, blanks and subject sample are 0.000 and no status messages are present.
4. Attach the test strips to the Verification of Calibration report, fill out and sign the form.
5. Mail the original form to the crime lab in a timely manner.

DIAGNOSTIC TEST STRIP

Circuit or Setting	Acceptable (Normal) Result	Result Indicating Problem with Circuit or Setting
Computer	Okay	Error
Program	Okay	Error
Software Date	Any date	
Heaters – Sample Chamber	45-55°C	Too Hot/Too Cold
Heaters – Breath Tube	40-45°C	Too Hot/Too Cold
Barometer	Typically 27.50 in to 32.00 in	
Flow Detector	Okay	Error
Pump – High Speed	Okay	Error
Detector	Okay	Error
Filters	Okay	Error
Quartz Standard	Okay	Error

When the crime lab receives a Verification of Calibration report it is reviewed and approved by the scientific director. The original Verification of Calibration report will be filed in the DataMaster instrument file at the crime lab. Certified copies of the Verification of Calibration report will be scanned and posted on the crime lab website.

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Change in Instrument Status Report

The breath alcohol program keeps a record of all maintenance and movement of the DataMaster instruments. Breath test supervisors should notify the crime lab of any change in status of the instrument(s) at their agency by filling out a Change in Instrument Status Report and submitting it to the crime lab.

The following situations would require a Change in Instrument Status Report to be filled out by the breath test supervisor:

1. Placing an instrument in service or removing an instrument from service.
2. Any indication of a functional operating problem with the instrument.
3. The relocation of an instrument to a new building.
4. Any maintenance to the instrument that represents a functional change in the operation of the instrument such as adjusting the flow detector circuit or the barometer reading.

The following information should be included in the Change in Instrument Status Report:

Instrument Serial Number (S/N)

Current status of instrument: In Service, Out of Service, In Transit or Other

Supervisor's name, ID number and agency

Date of report

The OUT OF SERVICE section of the form should be filled out if the instrument was out of service for any time.

The LOCATION CHANGE should be filled out if the instrument was moved or relocated. This includes sending and instrument back to the crime lab.

The MAINTENANCE REPORT section should be filled out if there was any maintenance performed on the instrument at the agency.

The completed Change in Instrument Status Reports should be sent to the crime lab where they will be filed in the instrument file.

Change in Operator Status Form

The breath alcohol program keeps a database of breath test operator information. To keep the database as accurate as possible, breath test supervisors are asked to submit a Change in Operator Status form whenever a breath test operator's status changes with regards to the breath alcohol program.

Situations that would require a Change in Operator Status form include: a breath test operator is hired at an agency, a breath test operator's employment is terminated at an agency, a breath test operator transfers to a different agency or location in the state or a breath test operator changes their name.

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Request for Certification/Recertification of Breath Instrument Operators Form

The breath alcohol program requires breath test supervisors to complete a Request for Certification/Recertification of Breath Instrument Operators form after training breath test operators at their agency.

When instructing a mixed class of certification and recertification students check the certification expiration dates for current breath test operators attending the course. If an operator's certification has expired, he/she must complete the 8-hour block of instruction. Indicate clearly on the Request for Certification/ReCertification of Breath Instrument Operators form which breath test operators are recertifying and which breath test operators are certifying or fill out two separate forms.

The crime lab issues breath test operator cards upon receipt of the Request for Certification/Recertification of Breath Instrument Operators form. The cards contain the breath test operator name, certification number, expiration date, and signature of the scientific director. The breath test operator should keep his/her card in his/her possession. Another breath test operator card will be issued when the operator completes a recertification.

Breath test operator cards are mailed to the instructor of the Certification or Recertification course. It is the responsibility of the breath test supervisor who submitted the Request for Certification/Recertification of Breath Instrument Operators form to distribute the cards to the individual breath test operators. If this is not possible it is the responsibility of the breath test supervisor to communicate with the crime lab about where the cards should be sent.

ORDERING SUPPLIES FROM THE BREATH ALCOHOL PROGRAM

The breath alcohol section of the crime lab supplies many of the consumables related to breath testing. These include:

- Printer paper rolls for the DataMaster
- Printer ribbons for the DataMaster
- Mouthpieces for the DataMaster
- Blood collection kits
- Homebrew collection kits

The breath test supervisor at each location will be contacted about annual supply orders.

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PROBLEM RESOLUTION (TROUBLESHOOTING)

Problems with the DataMaster stem from a variety of sources and may or may not reflect an underlying instrument malfunction. Problems with DataMaster operation are generally indicated by a status message. A list of the various status messages that can be seen with the DataMaster along with troubleshooting information is given below.

Description of Problem	How to Address the Problem
Ambient Fail	<ol style="list-style-type: none"> 1. Remove the subject from vicinity of DataMaster (if status message occurs during subject test) 2. Ventilate room 3. Use F1/F2 to purge sample chamber for approximately 1 minute (press ABT to end purge) 4. Perform a non-drinking subject test 5. If ambient fail persists contact crime lab (breath test supervisors)
Blank Error	<ol style="list-style-type: none"> 1. Remove the subject from vicinity of DataMaster 2. Ventilate room 3. Use F1/F2 to purge sample chamber for approximately 1 minute (press ABT to end purge) 4. Perform a non-drinking subject test 5. If blank error persists contact crime lab (breath test supervisors)
Breath Hose Too Cold	<ol style="list-style-type: none"> 1. Check breath hose to see if it feels cold 2. If cold, check to see if breath hose heater plug is plugged in 3. If Breath Hose Too Cold persists contact crime lab (breath test supervisors)
Breath Hose Too Hot	<ol style="list-style-type: none"> 1. Check breath hose to see if it feels hot 2. If hot, moving the hose off the cover of the DataMaster may correct the problem. With the breath hose on the side of the instrument, try the test again. 3. If Breath Hose Too Hot persists over several days contact crime lab (breath test supervisors)
Data Memory Battery Low	<ol style="list-style-type: none"> 1. Turn instrument off and on again. 2. If Data Memory Battery Low persists contact crime lab (breath test supervisors)
Detector Overflow	<ol style="list-style-type: none"> 1. Use F1/F2 to purge sample chamber for approximately 1 minute (press ABT to end purge), if status message occurs during a subject test. If status message occurs during second test, with a sample provided properly, take subject to hospital, their breath alcohol may be greater than 0.60.

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	2. If Detector Overflow status message occurs at a time when a subject is not being tested, contact the crime lab (breath test supervisors)
Detector Too High	1. Turn instrument off and on again. 2. If Detector Too High persists contact crime lab (breath test supervisors)
Detector Too Low	1. Turn instrument off and on again. 2. If Detector Too Low persists contact crime lab (breath test supervisors)
Fatal System Error at XXXX	1. Perform a Cold Reboot by turning the instrument off, and then hold the CLR button down while you turn the instrument back on. Release CLR button. 2. If Fatal System Error at XXXX persists contact crime lab (breath test supervisors)
Filter Error	1. Turn instrument off and on again. 2. If Filter Error persists contact crime lab (breath test supervisors)
Flow Detector Error	1. Allow the instrument to warm up to room temperature for at least 10 minutes and then perform a diagnostic test. 2. Turn the instrument off and on again. 3. If Flow Detector Error persists contact crime lab (breath test supervisors)
Incomplete (when seen during a subject test)	1. Restart test, if subject has not been charged with refusal.
Interference Detected (When seen during a subject test)	1. Restart test, direct subject to provide a sample steadily. 2. If Interference Detected status message occurs twice in a row on the same subject, who appears to be blowing properly, get a search warrant for blood. 3. If Interference Detected status message occurs with unusual frequency, contact crime lab (breath test supervisors)
Invalid Sample (When seen during a subject test)	1. Restart test, direct subject to provide a sample steadily. Watch for inappropriate blowing behavior such as: blowing around the mouth piece, blocking mouthpiece with tongue, etc. 2. If Invalid Sample status message occurs with unusual frequency, contact crime lab (breath test supervisors)
Memory Near Full	1. Contact the crime lab (breath test supervisors)
Memory Full	1. Contact the crime lab (breath test supervisors)

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Not Calibrated	<ol style="list-style-type: none"> 1. Turn instrument off and on again. 2. If Not Calibrated persists, contact the crime lab (breath test supervisors)
Out of Service	<ol style="list-style-type: none"> 1. Operators should check with Supervisors to see if instrument was taken out of service. 2. If Supervisors did not take out of service, contact the crime lab (breath test supervisors)
Printer Error	<ol style="list-style-type: none"> 1. Check paper supply. 2. Check for paper jams, obstructions or a dislodged printer ribbon. 3. If problem is present, correct and press CPY to make sure printer is operational. 4. Check to see if printer has been set to correct option (internal/external) using set/adv keys 5. If Printer Error status message persists, contact crime lab (breath test supervisors)
Pump Error	<ol style="list-style-type: none"> 1. Check mouthpiece, check valve and breath hose screen for blockage. 2. Remove breath hose from instrument and blow through it. 3. Use F1/F2 to purge sample chamber for approximately 1 minute, listening for abnormally muffled pump noise. 4. Lift up cover and press TST, watch plunger on 5 way valve to see if it engages. If it does not engage, contact the crime lab (breath test supervisors) 5. If Pump Error persists, contact crime lab (breath test supervisors)
Radio Frequency Detected (When seen during a subject test)	<ol style="list-style-type: none"> 1. Locate the source of the RF interference (radio in operation in vicinity of DataMaster) and remove from vicinity. Restart test. 2. If Radio Frequency Detected persists, contact the crime lab (breath test supervisors)
Ram Error at XXXX	<ol style="list-style-type: none"> 1. Perform a Cold Reboot by turning the instrument off, and then hold the CLR button down while you turn the instrument back on. Release CLR button. 2. If Ram Error at XXXX persists contact crime lab (breath test supervisors)
Standard Out Of Range	<ol style="list-style-type: none"> 1. Check the Alco tank to see if it is turned on, and make sure there is pressure in the tank.

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	<p>2. Check the flow rate on the regulator; it should be set between 3 and 5. (You can only check the flow rate when gas is being drawn into the instrument.)</p> <p>3. Detach ferrule fitting from the back of the DataMaster and turn Alco on to make sure the line is clear.</p> <p>4. Make sure the correct target value is programmed in. (Use F1/F2 to change it).</p> <p>5. Check the barometer reading using the MTR button, if barometer is out of range call the Crime Lab (Supervisors).</p> <p>6. If Standard Out of Range status message persists, contact the crime lab (breath test supervisors)</p>
System Won't Zero	<p>1. Use F1/F2 to purge sample chamber for approximately 1 minute (press ABT to end purge), and ventilate the room.</p> <p>2. Turn instrument off and on again.</p> <p>3. If System Won't Zero status message persists, contact the crime lab (breath test supervisors)</p>
Temperature High	<p>1. Check ambient temperature of room - should be less than 80°F.</p> <p>2. Turn instrument off and turn back on.</p> <p>3. If Temperature High status message persists, contact the crime lab (breath test supervisors)</p>
Temperature Low	<p>1. Make sure the DataMaster has been turned on for at least one hour, and that the "Ready - Push Run" message has displayed before starting a test.</p> <p>2. Check ambient temperature of room - should be higher than 40°F</p> <p>3. Turn instrument off and turn back on.</p> <p>4. If Temperature Low status message persists, contact the crime lab (breath test supervisors)</p>
Insert Ticket	<p>1. Verify that internal/external printer is selected using SET/ADV keys</p> <p>2. If status message persists contact the crime lab (breath test supervisors)</p>
Any jumbled characters or status messages not described above.	<p>1. If status message persists contact the crime lab (breath test supervisors)</p>

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Instrument problems with no status messages	
Alco Leaks	<ol style="list-style-type: none"> 1. Make sure the where the regulator connects to the Alco is seated correctly, and is not cross threaded. 2. Make sure ferrule fitting where regulator connects with instrument is seated correctly, and is not cross threaded. 3. Examine the hose (regulator to instrument) for breaks. 4. Perform a leak check, if regulator or gas line are defective, obtain replacements from the crime lab.
Test Strip Won't Print	<ol style="list-style-type: none"> 1. Make sure there is paper in the paper well and that it isn't jammed. 2. Make sure the printer ribbon is properly seated. 3. Look for "Printer Error" status message. If status message persists please contact the crime lab (breath test supervisors)
Blank Display, Dark Display, Characters Unreadable	<ol style="list-style-type: none"> 1. Perform a Cold Reboot by turning the instrument off, and then hold the CLR button down while you turn the instrument back on. Release CLR button. 2. If problem persists contact crime lab (breath test supervisors)
Display Frozen	<ol style="list-style-type: none"> 1. Perform a Cold Reboot by turning the instrument off, and then hold the CLR button down while you turn the instrument back on. Release CLR button. 2. If problem persists contact crime lab (breath test supervisors)
Subject has to blow too hard or too easy to get a breath test.	<ol style="list-style-type: none"> 1. Perform a self-test. If instrument <u>seems</u> to be accepting/not accepting the sample properly, contact the crime lab (breath test supervisors)
RFI/Interference Detected/Invalid Sample occurs with unusually high frequency	<ol style="list-style-type: none"> 1. Contact the crime lab (breath test supervisors)

If these suggestions do not resolve the problem or other problems exist please contact the crime lab at:

Breath Alcohol Section
(907) 269-5740
dps.scdl.toxicology@alaska.gov

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